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DARDANELLE FLOOD PLAIN MANAGEMENT STUDY

YELL COUNTY
ARKANSAS

COOPERATING AGENCIES

THE YELL COUNTY CONSERVATION DISTRICT

CITY OF DARDANELLE

The Arkansas Soil and Water Conservation Commission

And
U. S. Department of Agriculture
Soil Conservation Service
Room 2405
700 West Capitol Avenue
Little Rock, Arkansas 72201

JULY 1984

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INTRODUCTION:

The City of Dardanelle and the Yell County Conservation District requested the Arkansas Soil and Water Conservation Commission to conduct a flood plain management study of an area drained by an unnamed channel in southwest Dardanelle. The Commission requested assistance from the Soil Conservation Service in performing the study. Objectives of the study are to identify the following:

1. Flood hazard areas of the 10% and 1% flood events
2. Existing flood damages
3. Natural values
4. Flood plain management alternatives

The Dardanelle Flood Plain Management Study report was prepared in accordance with the August 1974 Joint Agreement for Flood Hazard Analysis and Flood Plain Studies between the U. S. Department of Agriculture, Soil Conservation Service (SCS) and the Arkansas Soil and Water Conservation Commission (AS&WCC). Participation by the SCS is in accordance with Federal Level Recommendation 3 of "A Unified National Program for Flood Plain Management", Section 6 of Public Law 83-566, and principles contained in Executive Order 11988, Flood Plain Management.

The AS&WCC supplied information concerning federally subsidized flood insurance. Residents of the area provided survey access and participated in a meeting held on June 4, 1984, in which study findings were presented and comments and responses received.

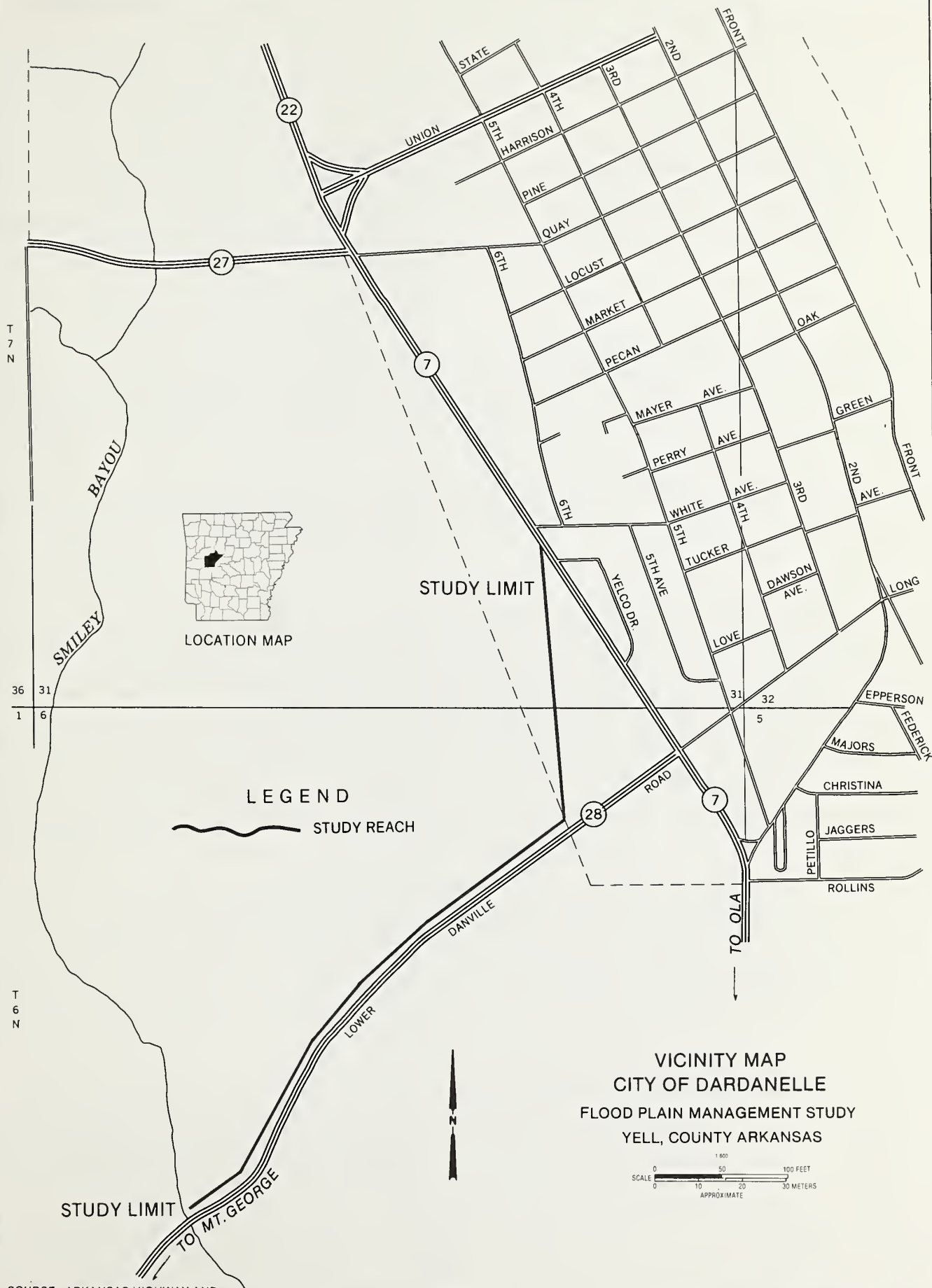
Field surveys were performed by SCS personnel to obtain required topographic information for the study. Water Surface Profiles were computed using the Water Surface Profile - 2 (WSP2) computer program. Peak discharges for the outlet, Smiley Bayou, were determined using Water Resource Circular 11, "Floods in Arkansas, Magnitude and Frequency Characteristics Through 1968" by James L. Patterson. The peak discharges for the unnamed channel (called Town Ditch in this study) were determined using SCS Technical Release 55, "Urban Hydrology for Small Watersheds". Water surface elevations in the study were obtained through the use of the above publications. The Urban Floodwater Damage Economic Evaluation (URBI) computer program was used in calculating economic damages for present flooding conditions and certain alternatives.

Many variables are utilized in performing hydrologic studies. These variables include factors such as soil moisture condition, watershed land use, precipitation amount and time distribution, and channel characteristics that influence water flow. This study is based upon conditions existing at the time of field investigations and assumes that hydraulic structures do not fail.

STUDY AREA DESCRIPTION

The City of Dardanelle (population 3,684) is located 75 miles northwest of Little Rock and 5 miles southwest of Russellville. The study area extends upstream approximately 1.2 miles from Town Ditch's outlet at the intersection of Smiley Bayou and Arkansas Highway 28 to the intersection of Arkansas Highway 7. (See vicinity map on page 3.) Located at the upper end of the study area is a subdivision with 90 houses, many of which are built on concrete slab floors. All of these houses and four commercial and industrial buildings are located upstream from Highway 7.

The study area is located in the Arkansas River Physiographic Region and is characterized by level alluvial areas with land uses of urban and cropland. Dardanelle has a mean annual temperature of 62 degrees Fahrenheit and a mean annual precipitation of about 48 inches.



NATURAL VALUES

Soil Resources and Land Use

The entire study area for the Dardanelle Flood Plain Management Study lies in the alluvial portion of the Arkansas River Valley on the banks of the Arkansas River. The soil series in the study area are Dardanelle and Roxana. These soils are deep, loamy, level to undulating and well drained. Land use within the study area is 311 acres of urban and 20 acres of cropland. The 20 acres of cropland is classified as prime farmland.

Fish, Wildlife, and Water Quality

Natural values in the City of Dardanelle have been greatly influenced by urban and agricultural activity. Town Ditch and its laterals are intermittent ditches which provide drainage for adjacent cropland and urban runoff. Water quality is influenced by agricultural operations and is expected to be of poor quality.

Fish habitat is nonexistent due to the lack of flowing water in the summer months. Wildlife diversity is poor due to the lack of good habitat and the monovegetation in the cultivated areas.

FLOOD PROBLEMS

During smaller storms, there is little flooding within the city limits of Dardanelle. Storms of larger magnitudes are the events which are responsible for flood damages. In December of 1982, residents reported that seven houses received damage from runoff of a rainfall measuring between 5 to 6 inches. Effects of storms are magnified because of poor internal drainage and the Arkansas Highway 7 fill with restricted openings. The channels and culverts are small and silt filled, and have little effect on removing runoff from larger storms. Downstream of Highway 7, Town Ditch is a manmade channel passing through an alluvial area which gives the resultant floodplain an unnatural shape. This shape is due to the channel lying on the east side of a low ridge giving the flood lines a straight appearance.

According to study results, the one percent chance flood event would flood about 31 acres of built-up area and cause varying amounts of damage to thirty-four buildings, resulting in an average annual damage estimate of \$3,152. The ten percent chance flood plain covers two acres of urban area and damages one building. (See map on page 5) The hydraulic and hydrologic studies were complicated due to flows crossing drainage divides into adjacent areas upon reaching certain elevations.

SCS study guidelines require the 0.2 percent chance flood be delineated where there is a potential of loss of life or toxic chemical storage in the area. A nursing home is located adjacent to the 1 percent flood plain on Green Street. When the 0.2 percent chance flood plain was determined, it showed the nursing home subject to flood damage.



LEGEND

320 — 1 PERCENT CHANCE FLOODWATER ELEVATION

10 PERCENT CHANCE FLOOD LIMITS

1 PERCENT CHANCE FLOOD LIMITS

0.2 PERCENT CHANCE FLOOD LIMITS

4 — CROSS SECTION LOCATION

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

Date of Photography 11-22-74

FLOOD PLAIN MANAGEMENT AREA	
TOWN DITCH	
U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DARDANELLE FLOOD PLAIN MANAGEMENT STUDY YELL COUNTY, ARKANSAS
SHEET 1 OF 1	

NOTE:
Limits of flooding shown may vary from actual locations on the ground and due to the inherent aerial photographic displacement the photographic IMAGE may vary from the ground location.

EXISTING FLOOD PLAIN MANAGEMENT

The City of Dardanelle is a participant in the regular phase of the National Flood Insurance Program. Date of entry into the program was June 1970. A Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map has been published for Dardanelle showing there is minimal flood hazard in the area of this SCS Flood Plain Management Report.

ALTERNATIVES FOR FLOOD PLAIN MANAGEMENT

Present Conditions

A major portion of the flood plain has been developed for residential use. Some open land exists within the one percent chance flood plain and it is used for cropland or vacant grass covered areas. There is presently no further development occurring within the flood plain.

Nonstructural Measures

Nonstructural measures identified to address flood problems in Dardanelle include acquisition of properties, floodproofing, zoning, building and development codes, and flood insurance. The measures are intended to avoid or minimize flood losses but they do not modify the flood characteristics. Explanations of each of these measures follow:

1. Acquisition consists of purchasing flood prone structures, removing them from the flood plain, and restricting land use in the flood plain. This alternative would not be economically feasible due to costs exceeding benefits.
2. Flood proofing is the modification of buildings, sites or contents to keep water out or reduce damage caused by the entry of water. Examples of flooding include sealing outer walls and installing waterproof closures at low openings, such as doors and windows.
3. Zoning is a means of controlling development within the designated flood plain. Continued enforcement of existing city ordinances is necessary to insure compliance. This alternative would not have any impact on current flood damages but would prevent additional construction in the flood prone area.
4. Building and Development Codes recognize that development must be controlled in the flood prone area. If local officials decide that some development in the flood plain is feasible, building codes will dictate the type of construction which could be accomplished. This alternative would allow controlled development in the flood prone area and prevent flood damages to structures in the future. This alternative would not have any impact on current flood damages.
5. Flood Insurance is available in Dardanelle under the regular program. While flood insurance will not prevent flood losses, it may partially reimburse property owners for flood damages. The current FEMA Flood Insurance Rate Map does show the area to be in the minimal flood hazard area. This report is available to FEMA for inclusion of elevation data on the Flood Insurance Rate Map and to establish actuarial rates.

Structural Measures

Structural measures are features used to modify or control the flood to reduce losses. Structural measures include dams, channels, dikes or other appropriate structures.

The topography of Dardanelle is too flat for the construction of floodwater retarding structures or dams. Dikes constructed around the flood prone properties are not feasible because of lack of space.

The channel improvement alternative was considered. Channel requirements to reduce flood damages were of minimal size but when the annual cost of the channel and necessary appurtenances, including modification of Highway 7, were compared to the average annual damages, the improvements were not economically feasible.

Combination of Alternatives

Due to the limitations in the study area in Dardanelle, a combination of structural measures was found to be infeasible. The main limitation that prohibits structural measures is that the area is too densely developed to allow space for works of improvements.

Recommendations

The recommended alternative in reducing the impacts of flooding in Dardanelle is continued participation in the Flood Insurance Program.

GLOSSARY

- Flood Damages:** The destruction or injury of property due to rising water levels. In this study, flood damages were assumed to occur when the flood water elevation equaled or exceeded the lowest opening point into the damageable property.
- Flood Frequency:** An expression or measure of how often a hydrologic event of given size or magnitude should, on an average, be equaled or exceeded. For example, on the average, a 10-year frequency flood is equaled or exceeded in size only once in 10 years or has a 10 percent chance of occurring during any given year.
- Flood Plain:** A land area next to a stream which is periodically inundated by floodwater.
- Flood Proofing:** Changing a structure and/or its contents so that water is kept out of the structure or the damage caused by water entry is reduced.
- Flow Restrictions:** An obstacle which limits the volume of water which passes through a specific section. Examples include dikes, dense vegetation, levees, culverts, bridge openings, buildings, and/or similar structures.
- Field Surveys:** The gathering of data with engineering equipment using horizontal and vertical distances to depict the features of stream valleys.
- NGVD:** National Geodetic Vertical Datum of 1929.
- Peak Discharge or Peak Flow:** The maximum volume of water per unit time that is expected as runoff from an area.
- Percent Chance:** 100 divided by the flood frequency in years.
- Prime Farmland:** The soil that is best suited for producing food, feed, forage, fiber, and oilseed crops. It gives the highest yields with minimum inputs of energy and money and results in the least damage to the environment.

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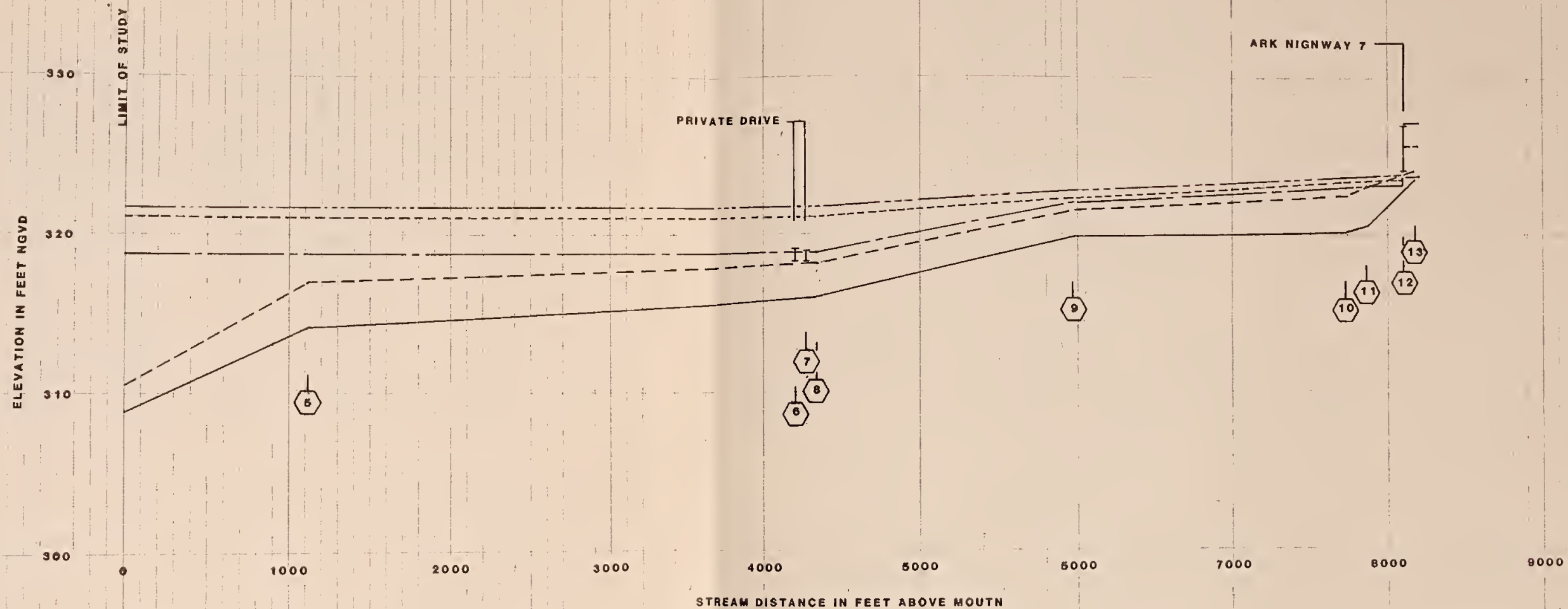
1. Technical Release 55, Urban Hydrology for Small Watersheds, Engineering Division, USDA, SCS, January 1975.
2. Technical Release 61, WSP2 Computer Program, Engineering Division, USDA, SCS, May 1976.
3. Urban Floodwater Damage Economic Evaluation Computer Application Program, Economics Division, USDA:SCS, January 1982.
4. Soil Survey of Yell County, Arkansas, USDA, Soil Conservation Service in cooperation with the Arkansas Agricultural Experiment Station, (not published).

Benchmark Data

BM E 253 - brass cap in top of a concrete post at ground level. Twenty feet south of the intersection of 2nd and Cedar Street. Northeast corner of the old Dardanelle High School. Elevation 333.95 NGVD.

TBM 5 - Top of fire hydrant. 100 feet east of Highway 7 on the south end of Yelco Drive. Elevation 329.26 NGVD.

TBM 8 - Chipped square on top of southeast concrete headwall on Highway 28 bridge across Smiley Bayou. Elevation 319.91 NGVD.



**OAROANELLE
FLOOD PLAIN MANAGEMENT STUDY**

**TOWN DITCH
FLOOD PROFILES**

**U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE**

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Traced _____	Sheet _____	Drawing No. _____
Checked _____	No. _____	of _____

APPENDIX 2

CROSS SECTION DATA

DARDANELLE FLOOD PLAIN MANAGEMENT STUDY

Cross	:Drainage :	<u>10% Chance Event</u>		<u>1% Chance Event</u>		<u>0.2% Chance Event</u>	
Section:	Area	:Discharge:	Elevation	:Discharge:	Elevation	:Discharge:	Elevation
(No.)	:(Sq. Mi.):	(cfs)	: (feet)	: (cfs)	: (feet)	: (cfs)	: (feet)
2	11.3	4,352	317.9	8,365	320.0	10,000	321.7
9	.17	58	322.0	227	322.0	265	322.8
10	.17	58	323.0	227	323.4	265	323.6
11	.17	58	323.1	227	325.6	265	323.7
12	.17	58	324.7	227	325.6	265	327.1
13	.17	58	324.7	227	325.6	265	327.1

APPENDIX 3 INVESTIGATION AND ANALYSIS

Topographic information used in this report was gathered by SCS personnel. Additional topographic information was obtained from U. S. Geological Survey Quadrangle Maps. Aerial photographs were obtained from the Agricultural Stabilization and Conservation Service Aerial Photography Field Office in Salt Lake City, Utah.

A staff biologist and a resource conservationist evaluated the study area to determine land use, soils, and fish and wildlife resources. Aerial photographs and soil surveys were utilized in the determination. The findings have been incorporated into this report.

Water surface profiles were computed using survey data and various other parameters as input into the SCS WSP2 computer program. Output from this program included elevation-discharge curves at specific cross sections. Peak discharge was computed for the 1 and 10 percent chance flood events by using SCS Technical Release 55, "Urban Hydrology for Small Watersheds." By combining the computed peak discharges and the elevation-discharge curves, the elevations for the floods were obtained at each cross section. Field surveys were made to determine the elevation of each building. Depth of flooding and flood damage was determined with the aid of the URB 1 computer program.

The width of the flooded area was determined at each of the cross sections. This was done by using the elevation of the flood profile at that location and determining the point at which that elevation intersected the ground on the plotted cross section. The flood boundary between cross sections was delineated between sections and through the use of quadrangle maps, and additional topographic surveys.

A public meeting was held in Dardanelle City Hall at 7:00 p.m. on June 4, 1984, to receive public input from concerned citizens. The meeting was publicized through local newspapers and radio stations. There were 21 people present representing the town citizens, 2 local newspapers, city and state governments, and the Yell County Conservation District. The meeting was called to order by Mayor Dana Merritt. Mayor Merritt is also a member of the Yell County Conservation District Board. An explanation of the flood plain management study's purposes, procedures, and findings was presented to those in attendance. At the end of the program, there was a question and answer segment. Comments from the people were minimal and consisted of what was needed to reduce flood damages. Also, several questions were asked about flood insurance availability and procedures.



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